MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

HMB2011 – INTRODUCTION TO MOLECULAR BIOLOGY

(All section / Groups)

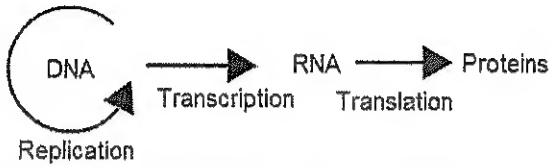
25 OCTOBER 2018
9.00 a.m. – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **4 pages** with **5 Questions** only.
2. Attempt **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please print all your answers in the Answer Booklet provided.
4. You can use calculator in the examination.

Question 1

a) The central dogma of molecular biology explains the flow of genetic information, from DNA to RNA, to make a functional product, a protein, as shown in the diagram below.



However, the central dogma is not really a dogma (as incontrovertibly true) in the traditional sense of word. Like all scientific theories, it is modified as we learn more details of the processes. Based on what you have learnt, give TWO examples of exceptions to the central dogma. **[2 marks]**

b) State the roles of the following chemicals in preparing DNA samples. **[2 marks]**

i. Ethylenediaminetetraacetic acid (EDTA)

ii. Ethanol

iii. Proteinase K

iv. Sodium dodecyl sulphate (SDS)

c) If you start with three double-stranded DNA molecules and you perform SIX cycles of PCR, how many double-stranded copies of the DNA will you have? **[1 mark]**

d) One of the most common methods of measuring DNA concentration and purity is absorbance reading (measured using a spectrophotometer). Briefly explain, what are the absorbance readings show you about the concentration and purity of a DNA sample **[3 marks]**

e) In agarose gel electrophoresis, what are the factors that determine the migration rate of DNA fragments? Name at least FOUR. **[2 marks]**

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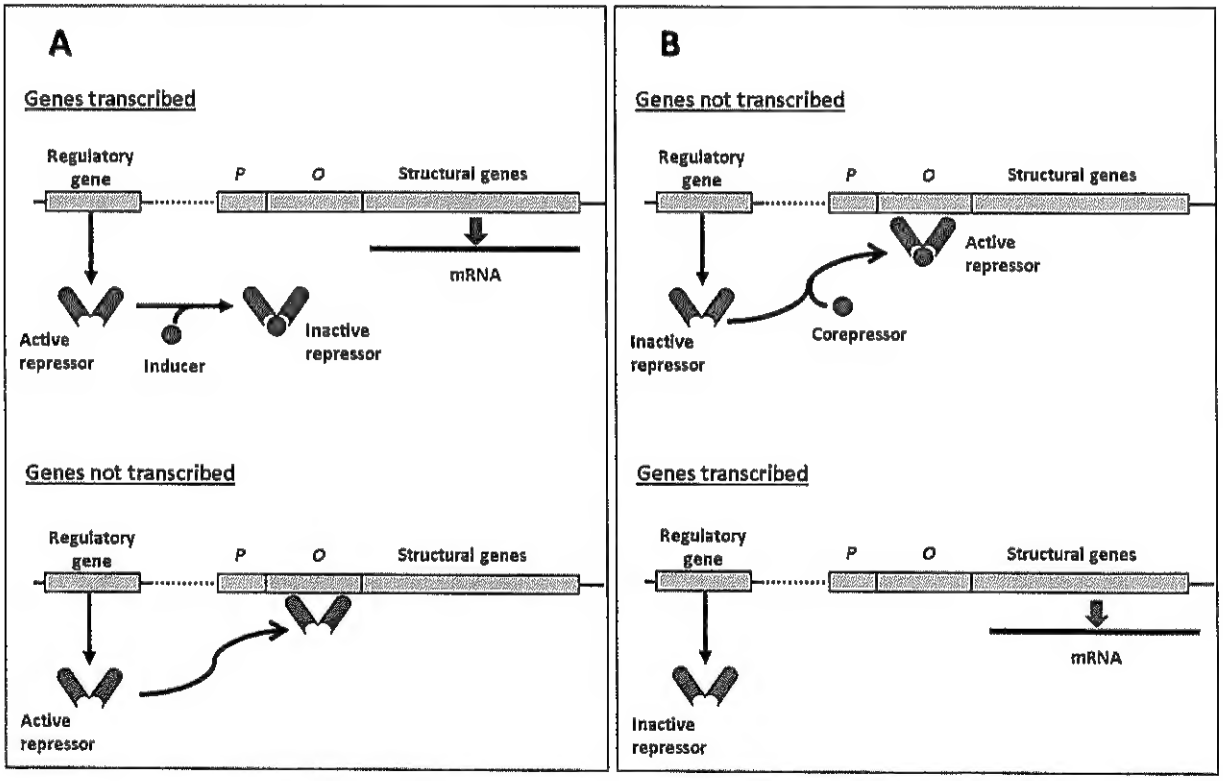
Question 2

a) How do prokaryotic and eukaryotic cells differ with regard to transcription and translation? Name FOUR differences. **[4 marks]**

b) The objective of regulation of bacterial virus (bacteriophage) genes is usually the orderly assembly of new phage particles without destroying the host cell too soon. Once phage lambda is a lysogen (it is already recombined into the genome), deletion of which gene(s) will cause the lysogen to go into the lytic cycle? **[1 mark]**

c) The primary RNA transcript of the chicken ovalbumin gene is 7700 nucleotides long, but the mature mRNA that is translated on the ribosome is 1872 nucleotides long. Why is it so? **[1 mark]**

d) Look at the following two diagrams. Compare and contrast the regulatory mechanisms depicted in (A) with those in (B). Which is more likely to regulate the enzymes of a catabolic pathway and which is more likely to regulate an anabolic pathway? Explain. **[4 marks]**



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Question 3

a) How does homologous recombination work and why this recombination is important? **[4 marks]**

b) What does DNA microarray technology measure and how does a microarray work? **[3 marks]**

c) Why is it important to know the sequence of DNA? **[1 mark]**

d) What is BLAST? Describe how unknown members of a proteome can be readily identified. **[2 marks]**

Question 4

a) How is *E. coli* transformed with plasmids carrying large DNA inserts? Describe TWO strategies for the selection of recombinant phage. (You may use illustrative diagram). **[3 marks]**

b) Briefly explain, TWO points that make cDNA library different from genomic library. **[2 marks]**

c) Describe THREE benefits of using transgenic plants. **[3 marks]**

d) Do male and female human genome physical maps differ? How are physical maps used? **[2 marks]**

Question 5

a) Why are restriction endonuclease and T4 DNA ligase important for DNA cloning? **[2 marks]**

b) Briefly explain FOUR major characteristic of well-designed cloning vector using appropriate examples. **[4 marks]**

c) Compare and contrast how do UV rays and X-rays or gamma rays damages the DNA. **[2 marks]**

d) Researchers examining the stability of different human chromosomes have found that the Y chromosome accumulates mutations at an unusually high rate. Provide a possible explanation for this finding. **[2 marks]**

End of Paper